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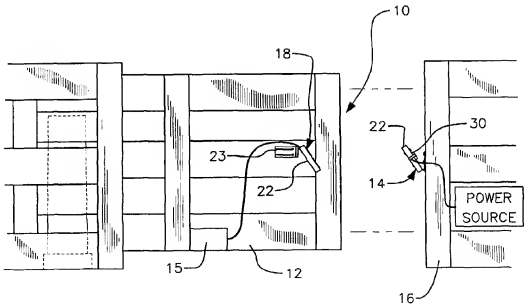
(54) **Title:** RECHARGING SYSTEM FOR A REMOTE CAPACITIVE SENSING APPARATUS



(57) **Abstract:** A charging system (10) for recharging a remote control module batteries (15) includes electrical contact pads (14) and (18). The first contact pad (14) includes a deicing circuit (28), and a charge enabling switch (36), and is mounted on a post or door frame which engages a sliding gate (12). The second contact pad (18) is connected to the remote control module (15), and is mounted on a sliding gate (12). A charge-enabling switch (38) is operative to cause a charge current to flow from a power source (32) to the remote control module batteries (15) through the first and second pads (14) and (18), when the first and second pads (14) and (18) are in electrical communication.

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RECHARGING SYSTEM FOR A REMOTE CAPACITIVE SENSING APPARATUS

RELATED APPLICATION

This application claims priority of United States Provisional Patent Application Serial No. 60/382,378 filed May 22, 2002, which is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to recharging systems and more particularly to recharging systems for use with remote control devices incorporated into object detection systems that utilize capacitive sensing techniques.

BACKGROUND OF THE INVENTION

It is common knowledge to sense the presence of an object using capacitive sensing techniques. Illustratively, an oscillator is operative to deliver a pulsed signal to a sensing element wherein the sensing element provides one of the plates of a capacitor that generates an electromagnetic field. When a grounded object approaches the field; it serves as the second plate of the capacitor whereby the capacitance that is formed between the sensing element and the grounded object varies with the distance between the same. Such a capacitive presence sensing apparatus is disclosed in U.S. Patent No. 5,337,034 to Simon. The apparatus therein has been used with various devices such as parking gate arms, lift gates and slide gates, and the like. When used on lift gates and slide gates, the capacitive sensors are connected to remote control modules. The remote control modules are typically mounted to the movable portions of the gates and comprise wireless communication circuitry and an internal power source such as a rechargeable battery.

To recharge the batteries of the remote control modules, complementary charging contacts are mounted to the movable portion of the gate and to a structure adjacent to the movable portion of the gate such that

charging power can be delivered to the batteries when the gate is closed. However, under certain conditions it is possible for snow and ice to collect on these charging contacts thereby rendering the charging system ineffective.

Accordingly, a charging system utilizing a pair of complementary contacts and a heat dissipating element having a heat sink has been developed. Additionally, the charging system includes a power-saving mode for increasing the useful life of the battery.

SUMMARY OF THE INVENTION

The present invention provides a recharging system for a remote control module wherein the charging system includes elements that allow the system to maintain its charging capability in inclement weather such as snow and ice, and includes a safety mechanism to prevent inadvertent shock or injury to the user.

The charging system provides complementary electrical contact pads wherein a first pad is in electrical communication with a power source and a second pad is in electrical communication with a rechargeable battery.

A deicing circuitry is disposed on the first pad that is connected to the power source such that the necessary current needed to energize the deicing circuitry can be obtained readily from a substantially unlimited source.

A deicing switch is provided in electrical communication with the deicing circuitry and the power source. The deicing switch is operative to energize the deicing circuitry at or below a predetermined temperature threshold.

A charge enabling switch is disposed on the first pad and is operative to permit a charge current to flow from the power source to the rechargeable battery through the first and second pads when the first and second pads are in electrical communication.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood by reference to the following detailed description in conjunction with the accompanying drawings

in which the like reference characters refer to like parts throughout the several views and in which:

Figure 1 illustrates a perspective view of a charging system for a remote control apparatus wherein the remote control apparatus is mounted to a sliding gate;

Figure 2 illustrates a schematic view of the supply and switch side of the recharging system as according to the invention;

Figure 3 illustrates an enlarged view of the contact pads of the recharging system being brought into electrical communication by closing the sliding gate of Figure 1;

Figure 4 exemplifies an embodiment of a contact pad which may be used on the load side of the recharging system;

Figure 5 exemplifies a contact pad which may be used on the supply side of the recharging system;

Figure 6 illustrates an exploded view of a remote control device which includes the rechargeable battery and a malfunction indicator enabling switch as according to the invention;

Figure 7 illustrates an embodiment of the recharging system incorporating a magnetic proximity switch as used with a conventional garage door; and

Figure 8 illustrates an enlarged view of the spindle portion of the garage door assembly wherein the spindle houses the magnetic proximity switch sensor.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a recharging system for use with a remote control module having a rechargeable battery and more particularly to a remote control module mounted on a movable object such as a sliding or lift gate. The inventive charging system provides additional features for enabling effective charging during inclement weather when snow and ice may form on various elements of the charging system to degrade the system's performance.

Additional features are added to protect against shock or injury to those coming into contact with the charging system inadvertently.

As shown in Figure 1, the charging system 10 includes a pair of complementary electrical contact pads 14 and 18. The first contact pad 18 includes a deicing circuit and a charge enabling switch which prevents inadvertent shock or injury to those who may come into contact with the exposed pad. The second pad 18 is mounted to a movable object such as a sliding gate 12 or door while the first pad 14 is mounted to a fixed member such as a post or door frame which engages the sliding gate 12 when the gate 12 is moved to a closed position. The second pad 18 is connected to a remote control module 15.

Each contact pad includes a nonconductive support portion 22 disposed with at least one electrical contact. As illustrated in Figure 3, the support portion 22 of the pad 18 is mounted on an outer portion of a resilient strap 20 which may be provided in the form of a V-shaped leaf spring. It is appreciated that other forms of resilient straps known to those skilled in the art may be used that are suitable for the purpose described herein. The strap 20 that supports the second pad 18 is mounted to a bracket 22 that is attached to the gate 12 via a conventional fastening means. The second pad 18 is attached to the resilient strap 20 at one end whereby the second pad 18 is supported thereto in an angled fashion. The first pad 14 is attached to a second resilient strap 20 in a complementary fashion to the second pad 18 such that when the pads abut one another upon the closing of the door 12, the resilient straps 20 become increasingly compressed such that the contact pads 14 and 18 become oriented substantially vertical when the sliding gate 12 is completely closed.

Preferably, the nonconductive support portion of each pad is formed of an extrudate material which may illustratively include Delron, nylon or polyethylene. Other nonconductive materials that may be used for the nonconductive support portion 22 may illustratively include plastic, rubber or wood.

As shown in Figures 4 and 5, the first 14 and second 18 pads include conductive members 24 and 26 respectively arranged on the nonconductive support portion 22 in a complementary manner to facilitate electrical communication between the conductive members 24 and 26 when the pads are engaged. As illustrated in Figure 5, the contact members 24 of the first pad appear as bolts while the contact members 26 of the second pad appear as elongated strips. The contact members 24 and 26 may be formed in various structural shapes and of any conductive material suitable for such purpose herein which may illustratively include copper, silver or other conductive metallic material of relatively low impedance. When the sliding gate 12 is closed, the pads 14 and 18 are brought together so that the contact members 24 and 26 slidably engage during the closing of the gate. It is appreciated that because the position of the gate after closure may vary from time to time, the resilient straps 20 are deformable to accommodate contact through a range of closure positions. It is further appreciated that various pad mounting and contact members arrangements may be resorted to by those skilled in the art without departing from the scope of the invention.

Referring again to Figure 1, the first pad 14 includes a deicing circuit 28 having at least one power resistor 30 mounted to a backside of the first pad 14. The power resistor 30 is connected to the contact members 24 of the first pad 14. Electrical power is supplied to the deicing circuit 28 from a power source 32 via an electrical conductor.

Referring now to Figure 2, the at least one power resistor 30 is associated with a heat sink 33 (not shown) and is connected to a deicing switch 36. The deicing switch 36 is operative to enable the deicing circuitry for the purpose of melting ice or snow that becomes disposed on the contact pads during inclement weather. Preferably, the deicing switch is operative to energize the deicing circuitry 28 automatically at or below a predetermined temperature threshold. Accordingly, the deicing switch 36 may be provided in the form of a temperature-sensing device such as thermostat or thermistor. If used, the thermostat may be of any type such as a bimetal thermostat that acts

to switch power to the power resistor 30 and heat sink when the temperature is at or below a predetermined threshold such as 34° Fahrenheit.

Referring now to Figure 3, the heat sink 33 generates heat when a supply voltage such as 24 volts is applied to the power resistor 30. In this manner, heat is dissipated through the contact members 24 which in turn will dissipate heat through to the contact members 26 of the second pad 18 when the pads 14 and 18 are engaged.

Electrical power is supplied to the first pad 14 from a power source 32. The power source 32 supplies a charging voltage to the contact members 24 that is higher than the voltage of the deicing circuit 28.

In order to prevent persons from inadvertent shock or injury from contact with the first pad 14, a charge-enabling switch 38 is disposed at the first pad 14. The charge-enabling switch 38 is operative to cause a charge current to flow from the power source to the rechargeable battery through the first and second pads when the first and second pads are in electrical communication. The charge-enabling switch may be provided in the form of a magnetic proximity switch, a momentary contact switch, an infrared detection switch, or the like. If a magnetic proximity switch is used, then the second pad 18 will be disposed with a magnet 40 as a means of activating the magnetic proximity switch to cause the flow of charge current from the power source to the rechargeable battery.

Thus, when the gate is open and the contact members separate, the charge enabling switch 38 will become disabled and the flow of current will be inhibited. However, when the gate is subsequently closed and the contacts are brought into engagement, the charge-enabling switch is tripped to close the circuit and energize the contact members with the charging current. In this fashion, there is provided a safe, reliable charging system that is not compromised by the effects of snow and ice. It is appreciated that the above described circuitry associated with the power side of the recharging system 10 may be associated with the load side without exceeding the scope of the invention.

Referring now to Figure 6, a remote control module 15 is illustrated having a housing 48 that includes a front panel 49. The housing 48 may also include a front panel cover 50 for protecting the front panel 49 from environmental exposure or vandalism. The front panel 49 of the remote control module 15 includes at least one malfunction indicator 52. The remote control module 48 includes electronic circuitry for generating and delivering control signals to some peripheral devices associated with the sliding gate 12 system.

Part of the electronic circuitry contained therein includes a diagnostic circuit that is in communication with the malfunction indicator 52. The malfunction indicator 52 may illustratively be provided in the form of a seven segment display LED or a liquid crystal diode device or the like for providing diagnostic numbers which correspond to various conditions of the system associated with the remote control module 48. When there is a system malfunction, a service person will remove the front panel cover 50 of the remote control module 48 to view the malfunction indicator 52 to determine the status of the equipment.

The malfunction indicator 52 may require a relatively large amount of electrical power that may compromise the utility of the remote control module which depends on a rechargeable battery for its power. To address this concern, the recharging system 10 preferably includes a malfunction indicator enabling switch 54 which is operative to power down the malfunction indicator display when the front panel cover plate is disposed over the front panel 49 of the remote control module 48. When the front panel cover 50 is removed from the remote control module 48, the malfunction indicator enabling switch 54 closes the circuit to power the malfunction indicator 52. Replacing the front panel cover 50 opens the malfunction indicator enabling switch 54 to disable the malfunction indicator as a means of conserving the power of the rechargeable battery.

Referring now to Figures 7 and 8, there is illustrated a type of charge enabling switch 38 which may be used with a remote control module 15 mounted on a conventional garage door 60 that is guided along a track 62 by

wheels 80 mounted to extend beyond the edges of the door 60. It has been found that incorporating a magnetic switch in a wheel assembly provides an excellent mounting place for the switch and allows for the mounting of the magnet 70 on the exterior of the guide track 62 to trip the switch when the switch passes through the field of the magnet 70. In this manner, the recharging system 10 may be enabled when the garage door is moved to the closed position.

Each wheel assembly includes a wheel 64 mounted on one end of a spindle 66. The center of the spindle 66 at the wheel end is bored and a charge enabling switch sensor 68 is mounted axially therein. The switch sensor 68 is mounted at the wheel end of the bore in the spindle 66 with a conventional fastening means or adhesive suitable for such purpose. The wheel assembly is then inserted into the door 60 and the magnets 70 are placed on the track 62 corresponding to the position where it is desired to send a signal indicating the passage of the wheel 64 and door 60. The switch sensor 68 is placed in electrical communication with the remote control module 15 via electrical conductors to facilitate a charging of the rechargeable batteries disposed in the remote control module 15 as according to the invention.

From the foregoing it can be seen that the present invention provides a charging system for a remote control module wherein the charging system includes deicing and charge enabling circuitry. Although the invention has been described with respect to certain illustrations and embodiments thereof, many modifications thereto may become apparent to one skilled in the art without deviation from the spirit of the invention as defined by the scope of the appended claims.

We claim:

CLAIMS

1. A charging system comprising:

complementary electrical contact pads wherein a first pad is in electrical communication with a power source and a second pad is in electrical communication with a rechargeable battery;

a deicing circuitry disposed on the first pad;

a deicing switch in electrical communication with the deicing circuitry and the power source, said deicing switch operative to energize the deicing circuitry at or below a predetermined temperature threshold; and

a charge enabling switch disposed at the first pad operative to permit a charge current to flow from the power source to the rechargeable battery via the first and second pads when the first and second pads are in electrical communication.

2. The charging system of claim 1 wherein the deicing circuitry comprises a power resistor with heat sink.

3. The charging system of claim 1 wherein the deicing circuitry comprises a coil with heat sink.

4. The charging system of claim 1 wherein the deicing switch is a thermostat.

5. The charging system of claim 1 wherein the deicing switch is a thermistor.

6. The charging system of claim 1 wherein the predetermined temperature threshold is 0° Celsius.

7. The charging system of claim 1 wherein the charge enabling switch is a magnetic proximity switch.

8. The charging system of claim 1 wherein the second pad includes a magnet operative to energize the magnetic proximity switch when the complementary electrical contact pads are in electrical communication.

9. A charging system for recharging a remote control module comprising:

complementary electrical contact pads wherein a first pad is in electrical communication with a power source and a second pad is in electrical communication with a rechargeable battery disposed in the remote control module;

a deicing circuitry disposed on the first pad;

a deicing switch in electrical communication with the deicing circuitry and the power source, said deicing switch operative to energize the deicing circuitry at or below a predetermined temperature threshold; and

a charge enabling switch disposed at the first pad operative to permit a charge current to flow from the power source to the rechargeable battery via the first and second pads when the first and second pads are in electrical communication.

10. A charging system for recharging a remote control module wherein the remote control module includes a malfunction indicator circuit and is disposed on a movable object, said charging system comprising:

complementary electrical contact pads wherein a second pad is in electrical communication with a rechargeable battery disposed in the remote control module, and wherein a first pad is disposed on a stationary object and the first pad is in electrical communication with a power source;

a deicing circuitry disposed on the first pad;

a deicing switch in electrical communication with the deicing circuitry and the power source, said deicing switch operative to energize the deicing circuitry at or below a predetermined temperature threshold;

a charge enabling switch disposed at the first pad operative to permit a charge current to flow from the power source to the rechargeable battery via the first and second pads when the first and second pads are in electrical communication; and

an indicator enabling switch disposed on the remote control module wherein said indicator enabling switch is in electrical communication with the rechargeable battery and at least one malfunction indicator.

11. The charging system of claim 10 further comprising a cover plate disposed over the indicator enabling switch such that removing said cover plate energizes the at least one malfunction indicator.

12. The charging system of claim 10 wherein the indicator enabling switch is a SPST switch.

13. The charging system of claim 10 wherein the movable object is a rail mounted sliding gate.

14. The charging system of claim 13 wherein the charge enabling switch is disposed on the rail such that charge current is permitted to flow when the sliding gate is in the closed position.

15. The charging system of claim 14 wherein the charge enabling switch is a magnetic proximity switch.

16. The charging system of claim 15 wherein the sliding gate is disposed with a magnet operative to energize the magnetic proximity switch.

17. The charging system of claim 1 further comprising a voltage sensing circuit.

18. The charging system of claim 17 wherein the voltage sensing circuit is operative to sense the voltage level of the rechargeable battery and disables the charge enabling switch when a predetermined voltage level is reached.

19. A remote control module having a housing with a rechargeable battery disposed therein, said remote control module comprising:

at least one malfunction indicator disposed on the housing;

a cover plate detachably fixed to the housing such that the cover plate is disposed over the at least one malfunction indicator; and

an indicator enabling switch disposed on the housing wherein said indicator enabling switch is in electrical communication with the rechargeable battery and the at least one malfunction indicator such that removing said cover plate energizes the at least one malfunction indicator.

20. The remote control module of claim 19 wherein said housing is disposed on a movable object.

21. A charge enabling switch for use with a recharging system, said recharging system being operative to recharge a battery disposed within a remote control module wherein said remote control module is disposed on a garage door that includes a guide wheel assembly that move along a guide track, said switch comprising:

a magnetic sensor switch disposed within a spindle the guide wheel assembly in communication with the recharging system and the remote control module; and

a magnet disposed on the guide track operative to enable the magnetic sensor switch when the garage door is moved to close whereby the recharging system is enabled to charge the battery.

FIG. 1

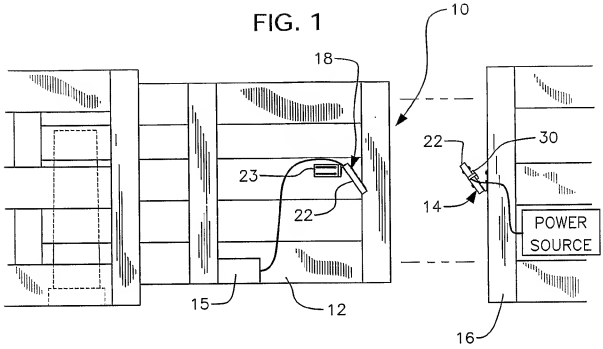


FIG. 6

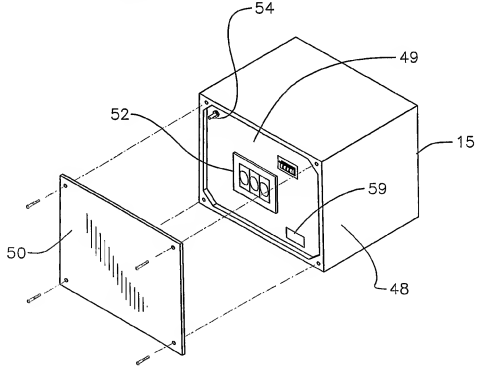


FIG. 2

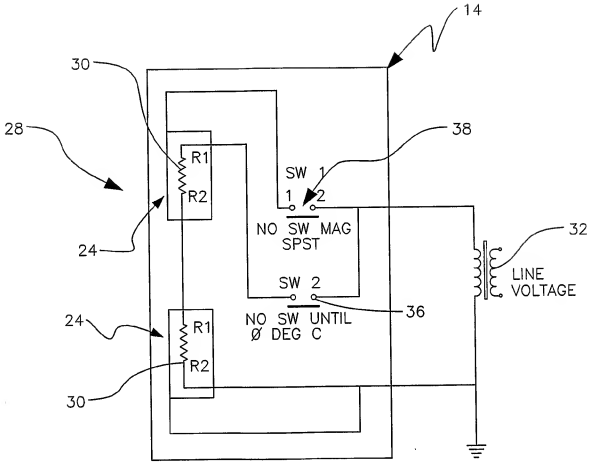

14
30
28
38
R1
R2
SW 1
1
2
NO SW MAG
SPST
24
32
LINE
VOLTAGE
SW 2
36
NO SW UNTIL
Ø DEG C
24
R1
R2
30

FIG. 3

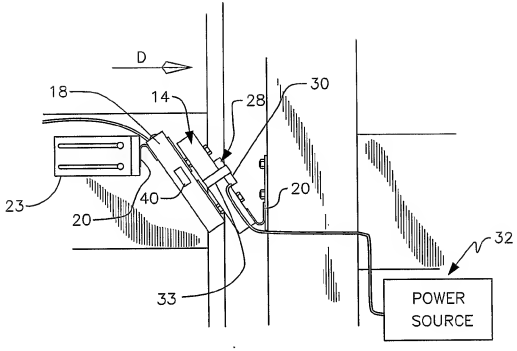


FIG. 4

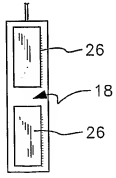


FIG. 5

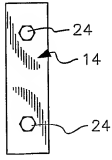


FIG. 7

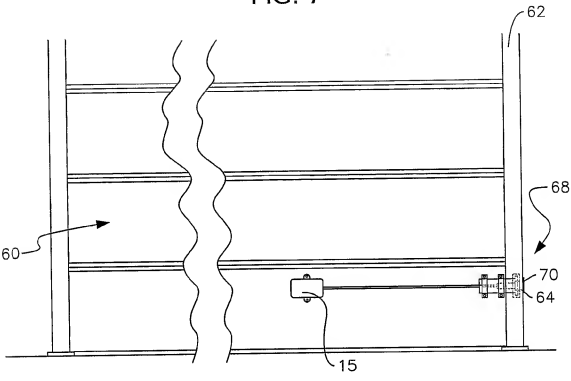
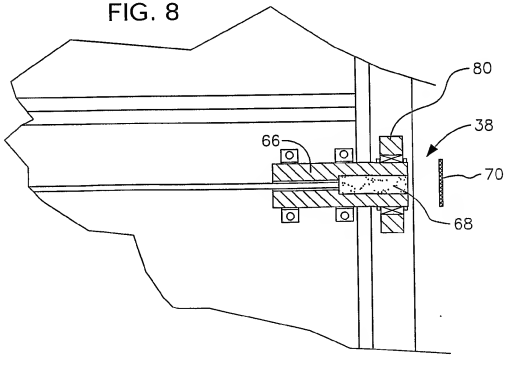


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US03/16205

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H02J 7/00; H02G 3/00; H02J 3/00; G06F 7/00
US CL : 320/104; 307/9.1, 10.1; 219/121.16, 121.65; 340/441, 670, 671
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 320/104; 307/9.1, 10.1; 219/121.16, 121.65; 340/441, 670, 671

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST, STN

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,013,994 A (TAKATSUKA) 07 May 1991.	NONE
A	US 4,862,055 A (MARUYAMA et al.) 29 August 1989.	NONE

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
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Date of the actual completion of the international search	Date of mailing of the international search report
24 JULY 2003	10 SEP 2003
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